SiPM tester – few updates, thoughts

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32 SiPM's measured by Tamas Majoros

SiPM test

Measured with SIPMMEAS-M1, SPS method

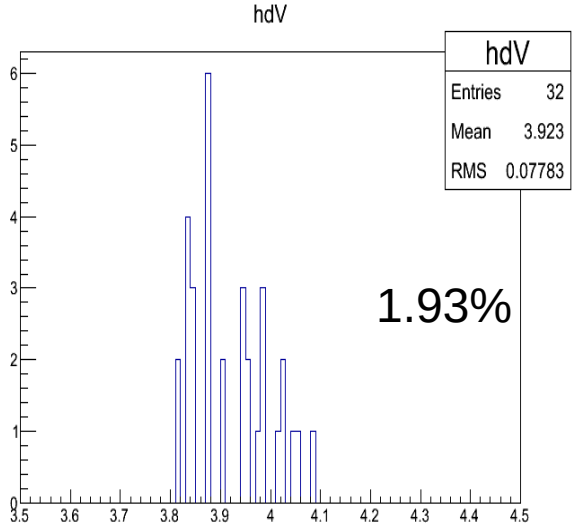
Hamamatsu S12572-015P (40000 ucell, 15 um pixel pitch)

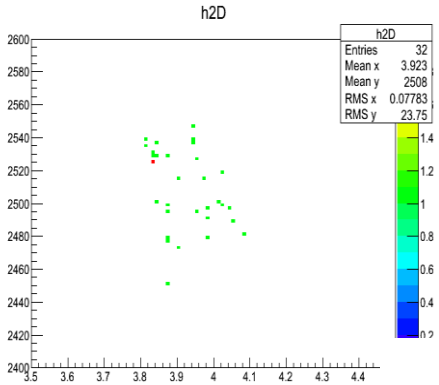
11-18-2016

Number	Serial	Vop(HM)	Vbd(HM)	Vbd(Meas)	Vbd diff	p0(constant)	p1(slope)
0	3435	68.98	64.98	65.01	0.03	-162715.82	2490.88
1	3438	68.91	64.91	64.97	0.06	-163151.11	2499.16
2	3528	68.97	64.97	65.03	0.06	-164356.17	2514.72
3	3553	68.90	64.90	65.06	0.16	-166510.33	2546.18
4	3555	69.00	65.00	65.10	0.10	-164569.80	2515.46
5	3559	68.97	64.97	65.05	0.08	-165933.01	2538.13
6	3560	68.96	64.96	65.05	0.09	-165889.27	2536.73
7	3741	68.88	64.88	64.94	0.06	-162401.59	2489.16
8	3754	68.88	64.88	64.96	0.08	-162964.56	2496.82
9	3757	68.93	64.93	64.99	0.06	-163235.33	2500.71
10	3758	68.97	64.97	65.01	0.04	-161855.05	2479.14
11	3775	68.88	64.88	64.97	0.09	-164367.71	2519.74
12	3776	68.95	64.95	65.02	0.07	-163096.78	2497.41
13	3783	68.96	64.96	65.04	0.08	-162970.23	2494.87
14	3784	68.88	64.88	64.91	0.03	-161696.42	2480.58
15	3797	68.94	64.94	65.04	0.10	-164994.76	2526.27
16	3425	69.11	65.11	65.13	0.02	-162211.14	2478.45
17	3428	69.10	65.10	65.12	0.02	-160399.00	2450.22
18	3431	69.13	65.13	65.15	0.02	-163739.81	2500.97
19	3433	69.12	65.12	65.12	-0.00	-163344.07	2495.61
20	3441	69.10	65.10	65.13	0.03	-165468.87	2528.04
21	3452	69.11	65.11	65.18	0.07	-166296.77	2538.45
22	3461	69.10	65.10	65.15	0.05	-166075.73	2536.40
23	3462	69.10	65.10	65.15	0.05	-165556.79	2528.47
24	3463	69.11	65.11	65.18	0.07	-166123.83	2535.88
25	3470	69.09	65.09	65.17	0.08	-165366.39	2524.49
26	3483	69.12	65.12	65.16	0.04	-165597.94	2528.67
27	3484	69.12	65.12	65.12	-0.00	-163577.61	2499.74
28	3498	69.11	65.11	65.12	0.01	-162103.02	2476.72
29	3529	69.10	65.10	65.17	0.07	-165367.45	2524.62
30	3537	69.12	65.12	65.17	0.05	-165799.66	2531.38
31	3551	69.10	65.10	65.10	0.00	-161834.53	2473.58

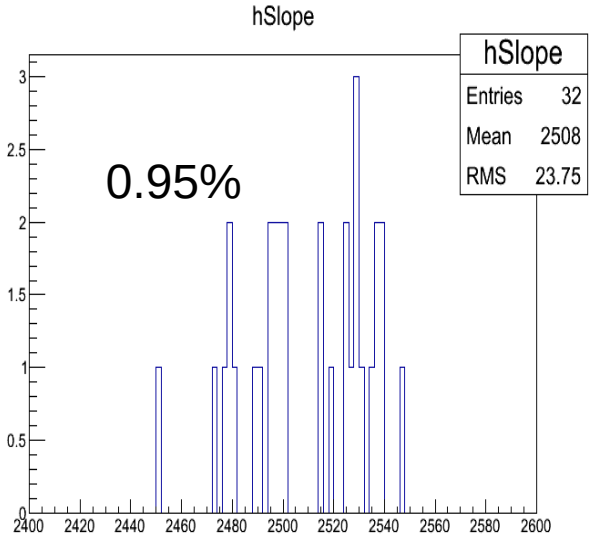
32 SiPM's measured by Tamas Majoros

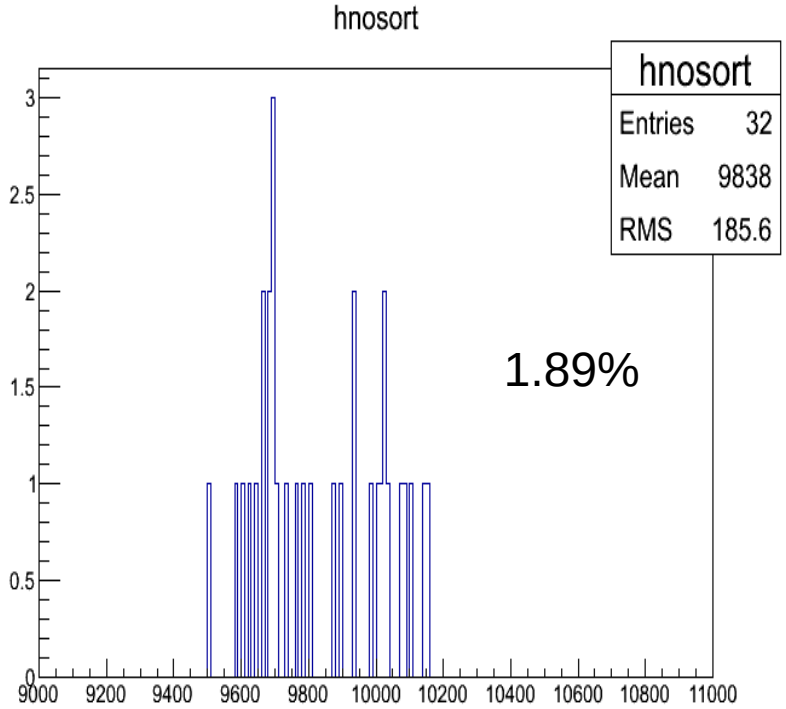
69 V – Vbd (i.e. no info on Vbd) No strong correlation





Gain imbalance without any sorting (assumes complete linearity, constant term in resolution)





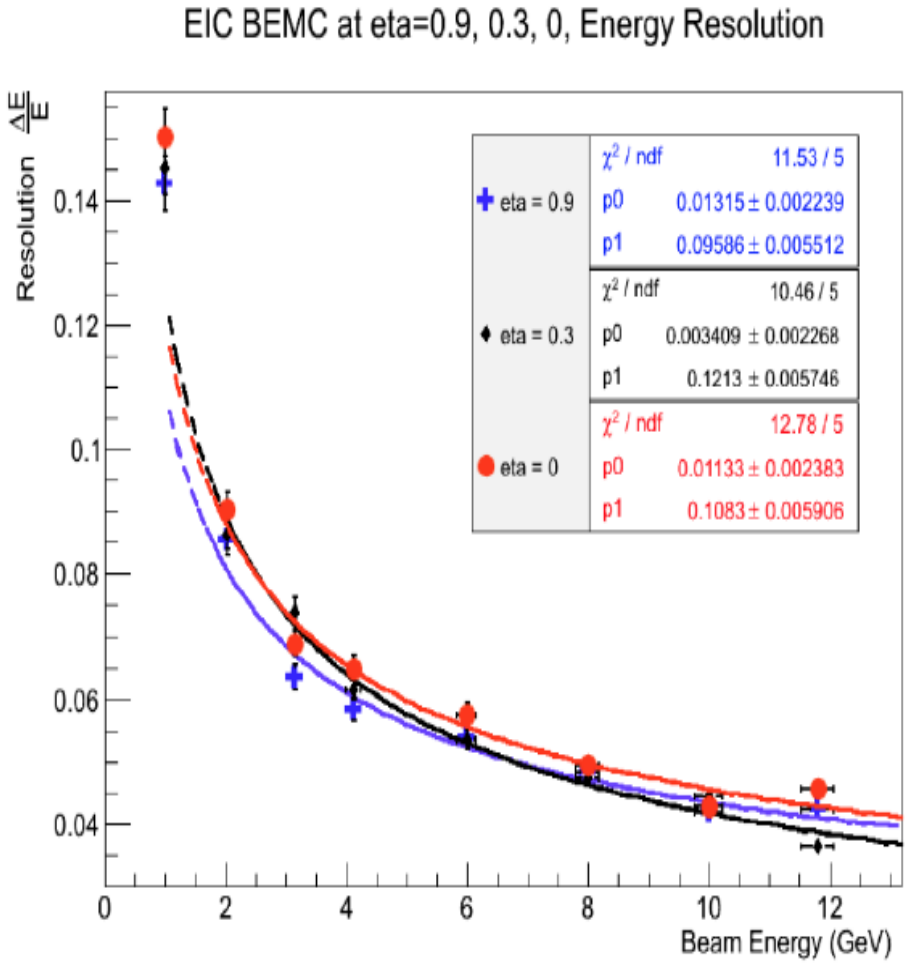
ECAL advertised resolution (1501.06197)

12%/sqrt{E}

Translates to 1.9% @ 40GeV

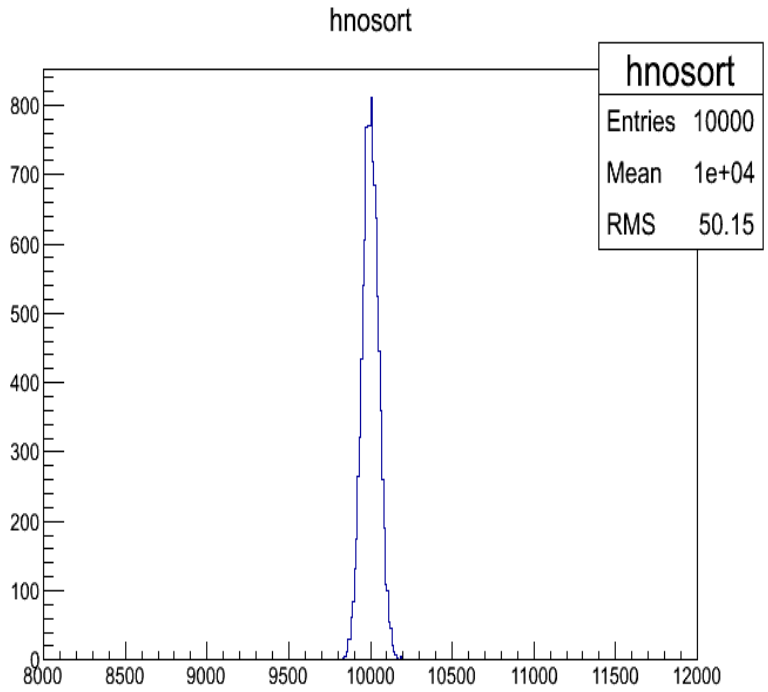
Keep the constant term from gain imbalance <= 1 %

(This does NOT address all factors entering into the constant term, saturation, nonlinearity, etc, cross talk, too high bias, etc. but obviously this is an absolute upper limit on scatter of slopes)

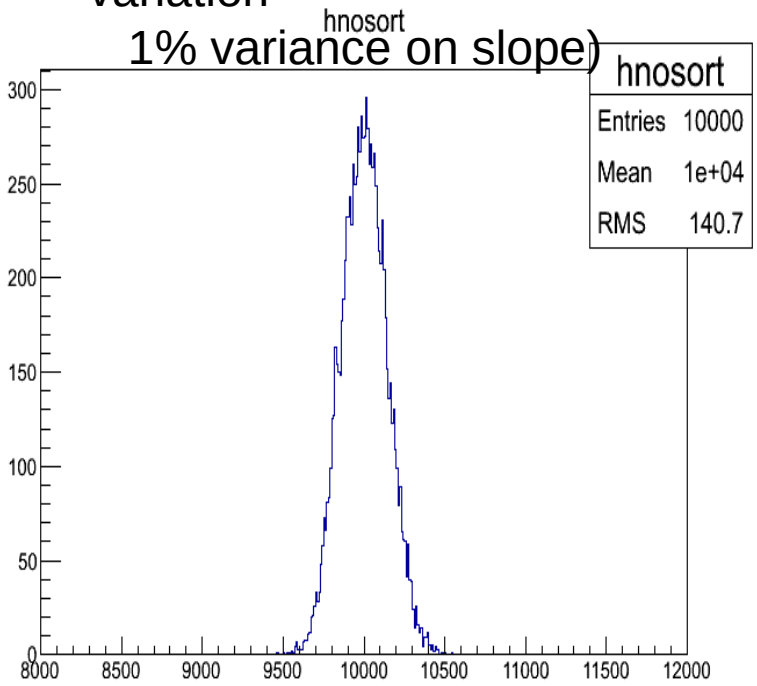


Assume zero / nonzero variance on slope, (Vop – Vbd) ~ 4V (as suggested by Hamamatsu)

Measuring Vbd to 20 mV precision
(trivial, 20 / 4000, 0.5% variation)



Measuring Vbd to 20 mV precision
(trivial, 20 / 4000, 0.5% variation
1% variance on slope)



And so on. Allowing +-1V (no sorting at all) introduces ¼ -> 25% variation on gain

Simple device to sort measured SiPM-s into … (trays? Bins?) according to VBD

Stepping motors in 2D,
linear in 3d dimension
(with suction cup)

Measured SiPM set: bottom left

Bins, trays for the sorted SiPM-s:
all other positions

Quite inexpensive

Just measured